ARCEUTHOBIUM PUSILLUM IN MASSACHUSETTS.

J. G. JACK.

(Plate 13.)

UNTIL the spring of 1898, the only localities in New England in which the so-called Small Mistletoe, *Arceuthobium pusillum*, had been found and reported by botanists were Lebanon and Canaan, New Hampshire, where it was collected by Prof. H. G. Jesup in 1883, and the station near Shelburne, New Hampshire, discovered in September, 1885, by Professor W. G. Farlow. It has been long known in the Adirondacks in New York State, and has been found in Pennsylvania.

It is only during the past two years that several new stations have been added to the range of the plant in New England, and further investigation will probably show it to be more generally distributed than is commonly supposed.

In the course of an examination of some lands appropriated by the Metropolitan Water Board, in the region about Boylston, Massachusetts, for the purpose of establishing the Wachusett Reservoir, and increasing the water supply for Boston and adjacent towns, I found this little parasite upon the Black Spruce, *Picea Mariana* (*P. nigra*, Link) growing in a small sphagnous swamp less than a mile north of Boylston station on the Massachusetts Central railroad. It is two and a half miles from West Boylston station or almost half-way between it and the Clinton station and nearly in a straight line between the two, close to the point where the Boylston, Clinton and Sterling township lines adjoin, most of the swamp being in the latter township. The location is approximately thirty-five miles west of Boston.

This swamp is about three hundred and seventy-five feet above sea-level and the area covered by Spruce affected by the Mistletoe is not more than six or eight acres in extent. In no case were the spruces more than twenty feet in height, averaging less than half that stature and especially dwarf on the more boggy or "quaking" parts of the swamp. With them were associated small Red Maples, Larches, Alders, Andromedas, *Kalmia angustifolia* and *Kalmia glauca*, *Gaylussacia resinosa*, and other trees and shrubs usually found in such situations, besides trailing cranberries, pitcher plants, etc.

The mistletoe was first discovered upon the spruce branches on April 21, 1898. It was then apparently in full bloom, the yellow

anthers of the staminate plants causing them to be much more conspicuous than the pistillate plants, which are not so likely to be noticed in flower unless sought. The date of flowering is interesting because in botanical publications it is usually given as June. When the plants under consideration were again examined on May 9 the staminate flowers had nearly all faded away. They are brownish and composed of a usually three- or four-parted calyx, upon each segment of which a sessile anther is borne, which is the most conspicuous part of the blossom when the yellow pollen is exposed.

This mistletoe is dioecious and the staminate and pistillate flowers are usually found on separate spruces or host plants, but sometimes on different branches of the same tree.

At maturity this little parasite rarely approaches an inch in length; most commonly it is less than half an inch long, the pistillate or fruiting plants apparently averaging longer than the staminate. The stems are greenish or greenish brown, slender, cylindric, usually less than a sixteenth of an inch in diameter, generally simple, sometimes with short opposite branches.

The stems are practically biennial, attaining full growth during one season, flowering and fruiting the next, after which they fall away and only the stem scars remain on the bark of the host. The staminate plants fall away in spring or early summer, soon after flowering, the pistillate not until after maturing of fruit in the autumn.

The mistletoe spreads with the growth of the twigs by means of haustoria or suckers beneath the bark of the host, and, in the autumn, small dark buds may be seen protruding through the bark of that portion of the twig which grew the preceding year, these developing into full sized plants the following year, having well developed flower buds which open the succeeding spring; so that the living plants of the parasite, in some stage, are to be seen in three growing seasons before they finally drop off.

In the autumn the fruiting mistletoe is found on the fourth year of growth back from the tip, while the plants for the next year occupy the next later growth or that of the third year preceding.

In this latitude the fruit ripens in the latter part of September. It is then of a translucent dull purplish color.

When ripe, the seeds are violently expelled from the berries at the moment that the latter become separated from their stalks, and a mucilaginous matter attached to the seeds causes them to stick to other

parts of the host or other plants in the vicinity, upon which they germinate, under favorable conditions.

The manner of seed expulsion in this genus, as seen in some western species, has been described by D. T. MacDougal in Minnesota Botanical Studies, 2nd series, part ii., February 22, 1899, p. 169–173.

No opportunity was obtained for observing the actual expulsion of seed from the Boylston plants, but this was seen very well in fresh specimens growing on white spruce in Maine, kindly furnished by Dr. Hermann von Schrenk.

The mistletoe at Boylston, as yet the only known locality for it in Massachusetts, is now nearly extinct, and will soon be completely eradicated, because, in the summer of 1898, the host-plants and other trees and shrubs were cut and burned to clear the ground for surveyors, and only a few small fragments of the mistletoe-bearing host escaped alive. These will soon be obliterated, because the swamp is to be filled or thoroughly cleaned out, and the pure waters of the reservoir will eventually flow over it.

This *Arceuthobium* may be found in other localities not far away. In looking for it, the hunter will be aided by the fact that the affected host-plants often appear distorted or stunted in comparison with perfectly healthy trees.

In the accompanying plate, generously furnished by Mr. C. E. Faxon, the figures have been drawn from specimens growing on black spruce collected in the Boylston locality.

ARNOLD ARBORETUM.

EXPLANATION OF PLATE 13. — *Arceuthobium pusillum*, Pk. Fig. 1, branch of black spruce in spring, with staminate Arceuthobium in flower; *a*, twig one year old; *b*, twig two years old; *c*, twig three years old. Fig. 2, branch in autumn with pistillate plants and fruit; *a*, twig one year old; *b*, twig two years old showing buds of the parasite; *c*, twig three years old with full-grown Arceuthobium; *d*, twig four years old with fruiting plants. Fig. 3, plant with mature fruit. Fig. 4, staminate plant in flower. Fig. 5, pistillate plant in flower. Fig. 6, staminate flowers. Fig. 7. pistillate flowers. Fig. 8, the same in vertical section. Fig. 9, fruit, showing manner of dehiscence and seed expulsion. Fig. 10, seed. (Figs. 1 and 2, natural size; figs. 3 to 10, enlarged.)

ARCEUTHOBIUM PUSILLUM ON A NEW HOST IN VERMONT. — I have been confident for several years that *Arceuthobium pusillum*, Pk., must occur in Vermont. The black or swamp spruce, its usual host, is common in the sphagnum swamps of the Champlain valley and elsewhere in the state. Professor Peck finds the Arceuthobium in the Adirondack